

Plant Propagation Laboratory Introduction and Exercise

Module 3

Rooting Hormones Collecting, preparing and storing cuttings

A. Propagation by cuttings

Many plants can be propagated by cuttings. House plants, summer annuals, florist crops, and perennials are propagated by herbaceous cuttings any time of the year that appropriate plant material is available. Species propagated by this means generally root faster and with a higher degree of success than species requiring softwood, semi-hardwood or hardwood stem cuttings. Many woody plants can be propagated by either hardwood, semi-hardwood or softwood stem cuttings. Some plants can be propagated by more than one type of cutting and others by only one type (often only with proper timing, use of root-promoting compounds, and very precise environmental conditions during rooting). Some plants may be impossible to propagate by cuttings.

B. Root promoting compounds

1. Reasons for treating cuttings with root-promoting compounds

- a. Increase the percentage of cuttings which form roots
- b. Reduce the time to root initiation
- c. Increase number of roots produced per cutting
- d. Increased uniformity of rooting

2. Compounds (auxins) used to promote rooting

a. IAA (Indoleacetic acid)

IAA is a naturally-occurring auxin but is not widely used because it is readily metabolized into inactive forms by the plant tissue.

b. IBA (Indolebutyric acid)

IBA is also a naturally-occurring auxin but is only produced in very small amounts within the plant. IBA is the most widely used synthetic auxin.

c. NAA (Naphthaleneacetic acid):

NAA is a synthetic auxin.

d. Other materials

Many phenoxy compounds, which are used primarily as herbicides, can be used as auxins. They can be used at low concentrations to induce rooting of certain species, but they have the disadvantage of potentially inhibiting shoot elongation. Examples include: 2,4-D; 2,4,5-T; 2,4,5-TP.

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3. Formulations of root-promoting compounds.

a. Pure chemical: pure crystals of a reagent grade chemical can be purchased from a chemical supply company.

Note: The acid forms of these chemicals are only soluble in alcohol. The potassium salt formulations of IBA (K-IBA) and NAA (K-NAA) are soluble in water.

b. Commercial preparations

1. Chemical(s) dissolved in a solvent

e.g. C-mone 1.0% IBA in alcohol, Dip'n Grow 1.0% IBA and 0.5% NAA in alcohol

2. Chemical(s) dispersed in a talc

e.g. Hormodin, Hormex, Rootone, etc.

A. Hormodin - IBA is dispersed in talc, comes in 3 concentrations

H#1 = 0.1% IBA (1,000 ppm)

H#2 = 0.3% IBA (3,000 ppm)

H#3 = 0.8% IBA (8,000 ppm)

B. Hormex is basically the same as Hormodin but comes in a wider range of formulations up to 4.5% IBA (45,000 ppm)

Hormex No. 1 = 0.1% IBA

Hormex No. 3 = 0.3% IBA

Hormex No. 8 = 0.8% IBA

Hormex No. 16 = 1.6% IBA

Hormex No. 30 = 3.0% IBA

Hormex No. 45 = 4.5% IBA

C. Rootone has 2 auxins [IBA and NAA + naphthaleneacetamide (NAM)] plus the fungicide, thiram, all are dispersed in talc.

D. Hormo-Root, comes in 3 formulations (all contain fungicide, thiram)

Hormo-Root A = 0.1% IBA

Hormo-Root B = 0.4% IBA

Hormo-Root C = 0.8% IBA

4. Preparing auxins from reagent grade chemicals

The following recommendations are based on using reagent grade chemicals that are 100% active ingredient. If your chemical is less than 100% active ingredient, be sure to compensate. A chemical that is only 60% active ingredient will require 1.67 times as much compared to a product that is 100% active ingredient.

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a. Liquid formulations

To prepare a liquid formulation which contains 5,000 ppm (0.5%) IBA, dissolve 5000 mg (5.0 grams) of IBA in 1 liter of solvent.

b. Talcum powder formulations

To prepare a talc formulation which contains 5,000 ppm (0.5%) IBA, mix 5000 mg (5.0 grams) of IBA with 95 grams of talc. Direct mixing of the talc and reagent grade chemical are not recommended since this will not provide a consistent mixture. The IBA should first be dissolved in a small quantity of alcohol, then mixed with the talc to form a slurry. The slurry should be dried with gentle heat to evaporate the alcohol. Once dry, this should be ground to pass a fine sieve.

5. Methods of auxin application

a. Dilute solution soaking method

Lower concentrations of a liquid auxin are used. Cuttings are allowed to soak in the solution for a period of time.

b. Concentrated-solution-dip method (quick-dip or concentrated-dip method)

Higher concentrations of a liquid auxin are used. Cuttings are dipped in and immediately removed or allowed to soak in the solution for 5 to 10 seconds.

c. Talcum powder mixtures

Cuttings are dipped directly into a small quantity of the talcum powder mixture. Some species may require a quick dip in water prior to dipping in the talcum powder to insure adequate treatment.

6. General guidelines for using rooting hormones

a. Talcum powder mixtures

Never dip cuttings in stock. Remove small quantity of powder from stock and use this for treatment. Any powder left after treatment should be discarded.

b. Concentrated auxin solutions

1. Never dip cuttings in stock. Remove small quantity of solution to satisfy immediate needs. Discard any left after treatment.

2. Stock solutions should be stored under dark conditions in the refrigerator.

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C. General guidelines for collecting and storing cuttings

When collecting cuttings it is very important that the cuttings not be permitted to suffer any desiccation injury. This can happen quite rapidly, particularly during periods of warm weather. A good way to avoid desiccation is to wrap cuttings in moist paper towels. Cuttings can also be placed in plastic bags. However, care must be taken to avoid placing the bags in a situation where heat can build up in the bags and injure the cuttings. When taking cuttings during periods of warm weather, collect cuttings early in the morning and immediately place them in coolers containing ice. This procedure prevents desiccation.

As a general rule cuttings should be stuck as soon as possible after they have been collected. If the cuttings are to be treated with a root-promoting compound, the sooner the cuttings are treated and stuck, the greater will be the rooting response. If a situation arises where cuttings cannot be stuck right away, they can be stored in a refrigerator until needed. When stored in the refrigerator, cuttings should be kept sealed in plastic bags. Generally, cuttings should not be stored for more than several days.

D. General procedures for preparing and sticking cuttings

1. Take cuttings from well-developed branches on "healthy" stock plants. Generally avoid material which has flower buds or from branches touching or growing near the soil surface. It is best to work with cutting material representing the current season's or past season's growth.
2. Length of cuttings should be 4-6 inches, but this varies somewhat with the species to be propagated.
3. If cuttings have leaves, strip the leaves from the lower one-third to one-half of the cuttings.
4. If the cuttings are not fresh, make a fresh cut at the basal end. Also, remove any tender wood at the tip of semi-hardwood cuttings.
5. If the cuttings are difficult to root, wound the stem and/or dip the basal ends of the cuttings into a root-promoting compound like indolebutyric acid (IBA) or a commercial auxin-talc preparation like Hormodin or Rootone.
6. Open the moist rooting medium and insert the cuttings just deep enough to stand. Remember to maintain correct polarity.
7. Space the cuttings $\frac{1}{2}$ to 2 inches apart in rows which are spaced such that foliage just touches.
8. Firm the cuttings into the medium and water gently but thoroughly to close any remaining air pockets in the propagating substrate.
9. If you are using an intermittent mist system, check all time settings, nozzles, nozzle overlap, etc. Check on reducing moisture needs frequently whether or not mist is being used.

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The following is a sample experiment to demonstrate the effects of auxin on rooting of herbaceous or woody cuttings. Follow the treatment structure assigned by your lab instructor based on the material on hand.

Determining the effects of auxin source, concentration and formulation on rooting of herbaceous and/or woody cuttings

Auxin source, concentration and formulation may have a dramatic effect on the rooting response of many plants. Some plants may respond to many auxin sources while others may only respond to one. For other plants, the form in which the auxin is applied may be the determining factor for rooting success. The concentration at which a given auxin is applied may also influence the rooting response of cuttings from some plants. The objective of this experiment is to determine the effects auxin source, formulation and concentration may have on the rooting percentage and root growth of an annual and a woody perennial (coleus and gardenia).

Methodology:

Prepare 72 comparable cuttings of a particular species or cultivar. Divide them in groups of 6 cuttings each. One group of 6 cuttings should be labeled and treated with each of the following auxin treatments.

1. Nontreated
2. Rootone
3. Hormodin 1
4. Hormodin 3
5. IBA 1000
6. IBA 5000
7. IBA 10,000
8. NAA 1000
9. NAA 5000
10. NAA 10,000
11. Dip'N Grow (high)
12. Dip'N Grow (low)

Treat each group by dipping the basal 3/4" of each cutting into the rooting powder or solution. Cuttings should remain in the solutions for a minimum of 10 seconds. Once all cuttings have been treated, they should be stuck in the mist bed or flat. Arrange the cuttings in the mist bed or flat such that all 6 cuttings of each treatment are grouped together.

All cuttings will be evaluated after several weeks and the number of cuttings rooted, number of roots per cutting, and mean root length recorded on the attached data sheet. You should collect rooting data with all students present. All students are responsible for obtaining the rooting information for all auxin treatments. Record your data on the data sheet provided and summarize. In your discussion be sure to discuss the effects of auxin treatment on rooting percentages and root number and how auxin treatments may have influenced the overall root quality or timing of rooting.